REMARKS

The above-identified application has been carefully reviewed in light of the Office Action mailed October 20, 2008.

Submitted herewith is a Request for Extension of Time, and required fee, extending the period for responding to the Office Action to and including March 20, 2009.

Without conceding the correctness of the Examiner's rejections, and in order to facilitate obtaining an early allowance in the above-identified application, certain of the claims have been amended. Applicant expressly reserves the right to seek patent protection for the original claims and/or any other claims supported by the above-identified application in one or more later filed related applications.

Specifically, claims 1, 2, 6, 10 and 32 have been amended to replace the phrase "further selected effect" with --selected optical effect--. Claim 1 has also been amended to delete the phrase "for providing", and to recite that the selected optical effect is --in addition to the effect of removing heat from the active layer--. Claim 25 has been amended to recite that he selected effect is --a selected optical effect--. These amendments are supported by the present specification, for example, at paragraphs 0027, 0031 and 0033. The claim amendments introduce no new matter.

The Examiner has provided guidelines illustrating the preferred layout for the specification of a utility application. Applicant understands that these guidelines are not mandatory. If applicant is requested to do so, applicant will provide a substitute specification prepared in accordance with these guidelines.

Claims 1, 6, 9-11, 18-22, 25, 27-30 and 32 have been rejected under 35 U.S.C. 102 (b), as being anticipated by U.S.

Patent Publication No. 2003/0039284 (hereinafter Zheng). Applicant traverses this rejection as it pertains to the presently amended claims 1 to 32.

Zheng describes a vertical-cavity surface emitting laser (VCSEL) having a heatspreader of the broad type known in the prior art and acknowledged in the present patent application, namely a transparent intracavity heatsink (present application, paragraph [0019]). The Zheng heatsink performs the function that any heatsink or heatspreader must perform in a VCSEL: it removes heat from the active layer of the device. As acknowledged in paragraph [0027] of the above-identified patent application, the thermal properties of a heatspreader can drastically improve output performance.

As noted above, independent claims 1, 25 and 32 and dependent claims 6 and 10 of the above-identified application have been amended to recite that the selected effect (in addition to the effect of removing heat from the active layer) is an optical effect. Therefore independent claims 1, 25 and 32 of the above-identified application and, in turn, their dependent claims, relate to a vertical-cavity device including a heatspreader that has at least two functions: (i)removing heat from the active layer, and (ii) having or causing a selected optical effect. A person of ordinary skill in the art would understand that the selected optical effect is an effect different from and additional to the effects arising from the heat-spreading function of the heatspreader, and is an optical effect, that is, it is a function that is performed on light, as opposed to a thermal effect or function performed on heat within the device.

On page 5 of the Office Action, the Examiner has identified various properties of the Zheng heatspreader:

> "The reference doesn't explicitly said heat spreader having at least one selected property that has a further selected effect on light output from the device, but explain a different characteristics has a heat spreader in addition to removing heat from active layer (e.g. the heat spreader can carry the heat to other material of the array outside the VCSEL). In addition to helping lower and control the temperature of the active region, the existence of heat-spreading layer also helps to make the temperature of the active region more uniform, thereby further improving the operation and efficiency of VCSEL"

However, the features identified by the Examiner are merely the standard features of any heatspreader. For example, a person of ordinary skill in the art would recognize that providing a heatspreader will usually have the effect of achieving a temperature distribution that is more uniform than it would be if no heatspreader were present. A heatspreader will usually have a higher conductivity than the active layer from which it removes heat, so excess heat from any hotter parts of the active layer will quickly be removed, tending to make the temperature distribution in the active region more uniform. But that is merely a manifestation of the primary function of a heatspreader function (i) above: spreading heat by removing heat from the active layer. It is a thermal effect or function.

Zheng therefore does not disclose the present invention, namely, a heatspreader having a selected optical effect or function, in addition to the heat-spreading function of a heatspreader, as recited in the present claims.

In view of the above, applicant respectfully submits that claims 1, 25 and 32, and all claims dependent thereon, are <u>not</u> anticipated by Zheng under 35 U.S.C. 102(b).

Furthermore, as is clear from the above discussion, Zheng does not teach nor make any suggestion whatsoever of a

heatspreader performing a selected optical effect on light output from the device in addition to the effect of removing heat from the active layer, as recited in the present claims.

Therefore, applicant respectfully submits that claims 1, 25 and 32 of the present application, and all claims dependent thereon, are non-obvious from and patentable over Zheng under 35 U.S.C. 103.

Applicant takes this opportunity to further address in detail some of the other remarks made by the Examiner regarding the novelty of dependent claims. In the following discussion, applicant has identified and addressed many of the issues, but, for the avoidance of doubt, the applicant hereby reserves the right to make further comments on the Examiner's statements in the event that they become significant with regard to patentability of the invention.

On page 6 of the Office Action, regarding dependent claim 9, the Examiner states that Zheng discloses a heatspreader that focuses pump light into the active layer. Applicant vigorously disagrees. It is difficult for a person of ordinary skill in the art to understand how a simple, flat heatspreading layer of the type shown in the drawings of Zheng could possibly have any focusing effect, and there is no disclosure, teaching or suggestion in Zheng that it does have such an effect.

Similarly, regarding dependent claims 16 and 17, there is no disclosure, teaching or suggestion in Zheng that the heatspreading layer has a shape selected to provide control of a spatial mode of the output light as recited in claim 16, nor that the heatspreading layer focuses or defocuses intracavity light as recited in claim 17. Present claims 18 and 19 are both dependent on and hence include all the features of claim 16. Consequently, applicant submits that there is no disclosure,

teaching or suggestion in Zheng that the heatspreading layer has a shape selected to provide control of a spatial mode of the output light, as recited in dependent claims 18 and 19.

On page 7 of the Office Action, regarding dependent claims 20, 21 and 22, the Examiner states that Zheng discloses a heatspreader having a second surface that has a dielectric coating which is an anti-reflection coating and the dielectric coating is a mirror coating and forms the second mirror. As mentioned above, Zheng does not disclose, teach or suggest the features recited in independent claim 1, wherein the vertical cavity device includes a heatspreader for removing heat from the active layer and has a further selected property that has a selected optical effect on the light output from the device, in addition to the effect of removing heat from the active layer.

On page 8 of the Office Action, regarding dependent claims 27 and 28, the Examiner states that Zheng discloses a curved surface formed by polishing or by etching. Applicant vigorously disagrees. There is no disclosure, teaching or suggestion in Zheng of a heatspreader having a second surface that is curved or includes a curved structure, as in present claim 26, and therefore no disclosure, teaching or suggestion of how such a surface is formed. Applicant disagrees with the Examiner's further comments regarding these claims 27 and 28. These claims are method claims and not device claims. Therefore, the issue of patentability of the device itself does not arise as it pertains to these method claims.

On page 9 of the Office Action, regarding claim 30, the Examiner states that Zheng discloses a source of pump light. Whilst that is clearly correct, applicant notes that such disclosure is not relevant to the patentability of claim 30, because present claim 30 requires that the source of pump light

comprise a device according to claim 1. There is no disclosure, teaching or suggestion in Zheng that the source of pump light described comprises such a device as in claim 1.

In view of the above, applicant submits that all of the present claims 1-32 are not anticipated by Zheng. Therefore, applicant respectfully requests that the rejection of these claims based upon 35 U.S.C. 102(b) be withdrawn.

Claims 5, 7, 12-16, 23 and 26 have been rejected under 35 U.S.C. 103(a) as being obvious over Zheng. Claims 2 to 4 have been rejected under 35 U.S.C. 103(a) as being obvious over Zheng in view of U. S. Patent No. 6,711,310 (hereinafter Chang et al). Claims 8 and 17 have been rejected under 35 U.S.C. 103(a) as being obvious over Zheng in view of U. S. Patent No. 6,393,08 (hereinafter Raymond et al). Claim 31 has been rejected under 35 U.S.C. 103(a) as being obvious over Zheng in view of U. S. Patent Publication No. 2002/0136254 (hereinafter Yoshida et al). Applicant traverses these rejections as they pertain to the presently amended claims 1-32.

As noted above, independent claims 1, 25 and 32 of the present application recite that the vertical-cavity device includes a heatspreader that has <u>at least two</u> effects or functions: (i) removing heat from the active layer, and (ii) having or causing a selected <u>optical</u> effect, in addition to the effect of removing heat from the active material. The selected optical effect is a function that is performed on light, as opposed to a thermal function performed on heat within the device.

From the above discussion, Zheng, in addition to not disclosing, does not teach and makes no suggestion whatsoever of a heatspreader performing a selected optical effect on light output from the device, as claimed in present independent claims

1, 25 and 32. Therefore, applicant respectfully submits that claims 1, 25 and 32 of the present application, and all claims dependent thereon, are non-obvious from and patentable over Zheng under 35 U.S.C. 103(a).

In addition to the above arguments, applicant presents the following additional arguments for non-obviousness of dependent claims 5, 7, 12-16, 23 and 26 over Zheng.

On page 13 of the Office Action, regarding claim 5, the Examiner alleges that it would be obvious to provide a heatspreader with a nonlinear optical response. Applicant vigorously disagrees. There is no disclosure, teaching or suggestion in Zheng of a heatspreader with a nonlinear optical response. Therefore, choosing to make a heatspreader from a material with a nonlinear optical response would certainly not be a matter of obvious design choice for a person of ordinary skill in the art based on the deficient teachings of Zheng. As the Examiner says, a person of ordinary skill in the art would select a material on the basis of its suitability for its intended use. Based on Zheng, where the intended use is as a heatspreader, it is not obvious for a person of ordinary skill in the art to select a nonlinear optical material.

On pages 13 to 14 of the Office Action, regarding claims 7, 16 and 26, the Examiner discusses the features that the second surface of the heatspreader is curved or includes a curved structure, and the heatspreader having a shape selected to provide control of a spatial mode of the output light. The Examiner asserts that those features are "particular dimensions", and that their inclusion is "an obvious matter of design choice". Applicant disagrees.

The above-noted features are not merely dimensions but are fundamental structural features. Heatspreaders usually have

plane-parallel faces. In optics, it is certainly not a matter merely of design choice, let alone an obvious matter of design choice, to move from plane-parallel faces to curved surfaces, because introducing curved surfaces will affect light passing through such surfaces. Prior art heatspreaders have been of a form that has a minimal effect on light passing through them. Applicant's discovery that providing a vertical-cavity device with a heatspreader of a different shape can have beneficial results is, in fact, one of the insights underlying the present invention.

The Examiner's further comments that "the applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or otherwise are critical" are not correct. Applicant's presentation regarding Figs. 5 to 8 of the above-identified application, at paragraphs [0102] to [0107], for example, provides a discussion of those features.

The Examiner's further comment that "it appears prima facie that the process would possess utility using another dimension" is wholly without any basis. There is no disclosure, teaching or suggestion in Zheng or any of the cited alleged prior art that would lead one of ordinary skill in the art to provide a curved surface on a heatspreader.

On page 17 of the Office Action, regarding claim 15, the Examiner alleges that it would have been obvious to make the second surface of the heatspreader at any angle. Prior-art heatspreaders typically have first and second surfaces that are parallel to each other and to the layers of the chip. It is a therefore a major design change to move from such arrangement to an arrangement in which the second surface of the heatspreader is at an angle to the layers of the chip. The Examiner's

assertion to the contrary appears to have been made only with the benefit of the hindsight provided by the applicant's invention and disclosure. Furthermore, the Examiner's comment that the specification contains no disclosure of either the critical nature of the claimed feature or any unexpected results arising therefrom is erroneous. The discussion of the feature is presented, for example, in paragraphs [0110] and [0111] of the above-identified application.

Claims 11-14, 23 and 24 are all dependent, directly or indirectly, on independent claim 1, and therefore include all the features of claim 1. Thus, claims 11-14, 23 and 24 are patentable over Zheng for at least the same reasons, for example, as discussed above, that independent claim 1 is patentable over Zheng.

Claim 28 is dependent on independent claim 25. Thus, claim 28 is patentable over Zheng for at least the same reasons, for example, as discussed above, that independent claim 25 is patentable over Zheng.

In view of the above, applicant submits that all of the present claims 1-32 are non-obvious from and patentable over Zheng under 35 U.S.C. 103(a).

In response to the rejection of claims 2-4 under 35 U.S.C. 103(a) over Zheng in view of Chang et al, applicant submits that, as discussed already above, presently amended independent claim 1, and therefore, dependent claims 2-4, are non-obvious from and patentable over Zheng under 35 U.S.C. 103(a).

Chang et al discloses an optical isolator including a light collector for redirecting and/or absorbing backward propagating radiation. On page 11 of the Office Action, regarding claims 2 and 4, the Examiner states that Chang et al teaches a

birefringent heatspreader with a further selected effect on polarisation. Applicant disagrees with this statement.

Chang et al does not disclose, teach or suggest the present claims. For example, Chang et al does not disclose, teach or even suggest a vertical-cavity device including a heatspreader for removing heat from the active layer and having at least one further selected property that has a selected optical effect on light output from the device, in addition to the effect of removing heat from the active layer, as recited in present claim 1, let alone such a vertical-cavity device in which the heatspreader is birefringent and the selected optical effect being on the polarisation of the output light, as recited in claim 2, which is dependent on claim 1.

In view of the fact that Chang et al does not disclose, teach or suggest the features of claim 2, applicant submits that Chang et al does not disclose, teach or suggest the present claims 3 and 4, which are further dependent on claim 2.

As noted above, Zheng is clearly deficient with regard to independent claim 1 and even more so with regard to claims 2-4. Chang et al neither provides nor even suggests supplying the deficiencies in the teachings of Zheng with regard to the present claims. Moreover, the teachings of Zheng and Chang et al are so different and distinct, one from the other, that one skilled in the art is provided with no basis for combining such different and distinct teachings of Zheng and Chang et al for any purpose, let alone for the purpose of obtaining the presently claimed vertical cavity device.

In view of the above, applicant submits that the present claims, and in particular claims 2-4, are non-obvious from and patentable over Zheng in view of Chang et al under 35 U.S.C. 103(a).

In response to the rejection of claims 8 and 17 under 35 U.S.C. 103(a) over Zheng in view of Raymond et al, applicant submits that, as already discussed above, presently amended independent claim 1, and therefore, dependent claims 8 and 17 are unobvious over Zheng.

Raymond et al discloses a frequency-doubled semiconductor vertical-external-cavity surface-emitting laser (VECSEL) for generating light at a wavelength in the range of 300-550 nanometers.

Raymond et al do not disclose, teach or suggest the presently claimed invention.

On page 14 of the Office Action, regarding claims 8 and 17, the Examiner states that Raymond teaches a heatspreader that focuses or defocuses intracavity light. Applicant disagrees.

The passage cited by the Examiner (Raymond, column 5, lines 49 to 53) describes focusing of a pump beam using a focusing mirror or alternatively one or more refractive or diffractive lenses. It also describes using a glass or fused silica plate to alter the shape of the beam. There is no mention of a heatspreader in that passage, let alone a heatspreader that focuses or defocuses intracavity light. Therefore, Raymond et al does not disclose, teach or even suggest the invention as recited in independent claim 1, let alone the invention of dependent claims 8 and 17.

Raymond et al does not provide the deficiencies apparent in the teachings of Zheng with regard to the present claims.

In view of the above, applicant submits that the present claims, and in particular claims 8 and 17, are non-obvious from and patentable over Zheng in view of Raymond et al under 35 U.S.C. 103(a).

In response to the rejection of claim 31 under 35 U.S.C. 103(a) over Zheng in view of Yoshida et al, applicant submits that as discussed already above, presently amended independent claim 1, and therefore, dependent claim 31 is unobvious over Zheng.

Yoshida et al disclose a semiconductor laser device and module for use in a dense wavelength division multiplexed optical communications system.

Yoshida et al does not disclose, teach, or even suggest the present invention of independent claim 1 or dependent claim 31.

The Examiner alleges that Yoshida teaches "amplifier or laser is a Raman amplifier" and that "it is well know in the art to apply the amplifier or laser is a Raman amplifier as discloses by Yoshida in Paragraphs [0005, 0010]".

As discussed above, Yoshida et al do not disclose, teach or suggest the present invention of claim 1, let alone the invention of dependent claim 31. Yoshida et al does not supply the deficiencies apparent in the teachings of Zheng with regard to the present claims.

In view of the above, applicant submits that the present claims, and in particular claim 31, are unobvious from and patentable over Zheng in view of Yoshida et al.

Each of the present dependent claims is separately patentable over the prior art. For example, none of the prior art, taken singly or in any combination, disclose, teach or even suggest the present devices and methods including the additional feature or features recited in any of the present dependent claims. Therefore, applicant submits that each of the present claims is separately patentable over the prior art.

In conclusion, applicant has shown that the present claims are not anticipated by and are unobvious from and patentable

over the prior art under 35 U.S.C. 102(b) and 103(a). Therefore, applicant submits that the present claims, that is claims 1-32, are allowable and respectfully requests the Examiner to pass the above-identified application to issuance at an early date.

Should any matters remain unresolved, the Examiner is requested to call applicant's attorney at the telephone number given below.

Respectfully submitted,

Frank J. Uxa
Attorney for Applicant
Reg. No. 25,612
4 Venture, Suite 300
Irvine, CA 92618
(949) 450-1750
Facsimile (949) 450-1764